Fishery Data Series No. 04-25

Recovery of Copper River Basin Coded Wire Tagged Chinook Salmon, 2001-2002

by
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November 2004

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

FISHERY DATA REPORT NO. 04-25

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November 2004

Development and publication of this manuscript were partially financed by the Federal Aid in Sport fish Restoration Act(16 U.S.C.777-777K) under Project F-10-17 and F-10-18, Job No. S-3-1(c).

The Division of Sport Fish Fishery Data Series was established in 1987 for the publication of technically oriented results for a single project or group of closely related projects. Since 2004, the Division of Commercial Fisheries has also used the Fishery Data Series. Fishery Data Series reports are intended for fishery and other technical professionals. Fishery Data Series reports are available through the Alaska State Library and on the Internet: http://www.sf.adfg.state.ak.us/statewide/divreports/html/intersearch.cfm This publication has undergone editorial and peer review.

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This document should be cited as:
Brase, A. L. J. and D. R. Sarafin. 2004. Recovery of Copper River Basin coded wire tagged Chinook salmon, 2001-2002. Alaska Department of Fish and Game, Fishery Data Series No. 04-25, Anchorage.

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ABSTRACT

In 1997 the Copper River wild Chinook salmon *Oncorhynchus tshawytscha* coded wire tag project was initiated to test the hypothesis that adult Chinook salmon from four stocks within the Copper River, with potentially different migratory timing, have the same exploitation rate in the Copper River District commercial drift gillnet fishery. During three seasons, 1997-1999, juvenile Chinook salmon were captured in four Copper River tributaries (East Fork Chistochina, Gulkana, Klutina, and Tonsina rivers), implanted with coded wire tags, secondarily marked by clipping the adipose fin, and released back into the natal river. Over the three years of tagging 214,383 juvenile Chinook salmon were tagged and released. Tag recovery efforts were conducted during the 2001 and 2002 seasons. From mid-May through mid-July the commercial catch of the Copper River District commercial drift gillnet fishery was screened for adipose-clipped Chinook salmon. A total of 171 and 160 adipose-clipped Chinook salmon were observed in 2001 and 2002 respectively. Of the adipose-clipped individuals observed, 163 fish in 2001, and 159 fish in 2002, were recovered, heads removed and sent to the ADF&G Coded Wire Tag Lab in Juneau for tag removal and code identification. Of the total sampled adipose-clipped Chinook salmon only eight in 2001 and 21 in 2002 were from the Copper River tag releases. The remaining adipose-clipped Chinook salmon were of various origins including Alaskan, Canadian and other U.S. hatcheries. The number of recoveries from the Upper Copper River tagging events was not sufficient to perform the analysis and complete the project objective.

Key words: Chinook salmon, coded wire tag, Copper River, CWT, East Fork Chistochina River, Gulkana River, hatchery, king salmon, Klutina River, *Oncorhynchus tshawytscha,* straying, Tonsina River

INTRODUCTION

Copper River Chinook salmon *Oncorhynchus tshawytscha* stocks are harvested in commercial, subsistence, personal use, and sport fisheries. From 1994 to 1998 an average of approximately 80,500 Chinook salmon has been taken annually in these fisheries (Table 1). The majority of Copper River Chinook salmon are harvested in the commercial drift gillnet fishery, followed by the sport and subsistence/personal use fisheries. The total Copper River Chinook salmon harvest peaked in 1998 and has since declined to levels similar to the highest documented harvests prior to 1994. Inspection of escapement indices and the annual harvests from these fisheries reveals fluctuations in fishery exploitation of these stocks. For sustained management, it is imperative for harvest patterns and spawning escapements to be better understood as more demands are placed upon these stocks by the various user groups.

The Copper River Chinook salmon fisheries are managed under current regulations outlined by the *Copper River King Salmon Management Plan* (AAC 2003). This management plan directs the Alaska Department of Fish and Game (ADF&G) to manage the Copper River commercial, subsistence and recreational fisheries to achieve a minimum total spawning escapement of 24,000 Chinook salmon. The best available data on harvest, age composition, and escapement are to be considered when making decisions about opening and closing fisheries.

Total Chinook salmon escapement to the Copper River has been estimated through mark recapture experiments performed by ADF&G and more recently the Native Village of Eyak (NVE) in cooperation with LGL Limited, Environmental Research Associates (LGL). Although these projects provide an estimate of total Copper River Chinook salmon escapement, few spawning tributaries are monitored for escapement. The Gulkana River is currently the only spawning tributary that is being directly monitored for escapement (Perry-Plake *In prep*). Aerial surveys are conducted annually to provide index counts of Chinook salmon in nine streams in the Upper Copper Basin. Index counts reflect the presence or absence of salmon relative to the other streams and previous years. Aerial surveys are not used as an estimate of total escapement to these tributaries.

Table 1.–Annual harvests of Copper River Chinook salmon, 1977-2003.

Year	Commercial	Retained from Commercial for Home Use[a]	Sport	Subsistence	Personal Use[b]	Subsistence + Personal Use	Total Harvest
1977	21,722	-	532	2,555		2,555	27,364
1978	29,062	-	641	2,239		2,239	34,181
1979	17,678	-	2,948	3,416		3,416	27,458
1980	8,454	-	2,101	3,035		3,035	16,625
1981	20,178	-	1,717	2,410		2,410	26,715
1982	47,362	-	1,802	2,764		2,764	54,692
1983	52,500	-	2,579	5,950		5,950	66,979
1984	38,957	-	2,787	509	1,760	2,269	46,282
1985	42,214	-	1,939	629	1,329	1,958	48,069
1986	40,670	-	3,663	686	2,367	3,053	50,439
1987	41,001	-	2,301	813	2,968	3,781	50,864
1988	30,741	-	1,562	992	2,994	3,986	40,275
1989	30,863	-	2,356	787	2,251	3,038	39,295
1990	21,702	-	2,302	647	2,708	3,355	30,714
1991	34,787	-	4,884	1,328	4,056	5,384	50,439
1992	39,810	-	4,412	1,449	3,405	4,854	53,930
1993	29,727	-	8,217	1,434	2,846	4,280	46,504
1994	47,061	751	6,431	1,989	3,743	5,732	65,707
1995	65,675	1,688	6,709	1,892	4,707	6,599	87,270
1996	55,646	2,169	9,116	1,482	3,584	5,066	77,063
1997	51,273	1,243	8,346	2,583	5,447	8,030	76,922
1998	68,827	1,411	8,245	1,842	6,723	8,565	95,613
1999	62,337	1,115	6,742	3,049	5,913	8,962	88,118
2000	31,259	740	5,531	8,024	-	8,024	53,578
2001	39,524	935	4,904	6,666	-	6,666	58,695
2002	38,734	773	5,098	5,677	-	5,677	55,959
2003	47,721	1,068	5,710[c]	2,537	2,533	5,070	59,569
			5 Year Averages				
1979-1983	29,234	-	2,229	3,515	-	3,515	38,494
1984-1988	38,717	-	2,450	726	2,284	3,009	47,186
1989-1993	31,378	-	4,434	1,129	3,053	4,182	44,176
1994-1998	57,696	1,452	7,769	1,958	4,841	6,798	80,515
1999-2003	43,915	926	5,597	3,530	3,350	6,880	57,318

[a] Commercial home use was not reported prior to 1994.

[b] The Copper River Chitina Subdistrict was a personal use fishery from 1984 – 1999, reclassified a subsistence fishery in 1999, and returned to a personal use fishery in 2003.

[c] Preliminary estimate.

From 1999 through 2003 extensive radio telemetry studies were conducted by ADF&G on the distribution and run timing of the Copper River Chinook salmon stocks (Evenson and Wuttig 2000, 2001; Savereide and Evenson 2002; Savereide 2003). Results of these studies demonstrated that run timing did vary among the different Copper River Chinook salmon stocks, with the upriver stocks (Chistochina and Gulkana rivers) arriving earlier than the lower river stocks (Klutina and Tonsina rivers). This relationship of run timing to distance from spawning grounds was similar to that seen in other large river systems (Burger et al. 1985; Pahlke and Bernard 1996). From 1999 to 2002 the Klutina, Tonsina, Chitina and Gulkana rivers made up the largest percentage of the total Copper River Chinook salmon escapement, with the Klutina River averaging 26%, Tonsina River averaging 21%, Chitina River averaging 19% and the Gulkana River averaging 18% (Savereide 2003).

Although the migratory timing of Copper River Chinook salmon has been documented through five years of radiotelemetry study, the relative exploitation rates of each stock in the commercial fishery are unknown. Chinook salmon are harvested by the commercial drift gillnet fishery at the mouth of the Copper River, fish are believed to mill in this area and therefore several stocks may be harvested at once. As part of a long-term program of stock assessment for Chinook salmon in the Copper River, this coded wire tagging (CWT) study was initiated in 1997, consistent with the methods of Cormack and Skalski (1992). The objective of the study was to test the hypothesis that adult Chinook salmon from four stocks with potentially different migratory timing have the same exploitation rate in the Copper River drift gillnet commercial fishery with a power of 90% to detect a difference in rates of no greater than 30 percentage points at the 95% percent confidence level.

METHODS

TAG DEPLOYMENT

A brief summary of the tag deployment methodology is presented here. Detailed methods for tag deployment are presented in Sarafin (2000).

Tags were deployed in juvenile Chinook salmon of the East Fork Chistochina (upper Copper Basin), Gulkana (middle Copper Basin), Klutina (lower Copper Basin), and Tonsina (lower Copper Basin) rivers through the three year period of 1997-1999 (Figure 1). In this process, juvenile Chinook salmon were captured using standard, steel mesh minnow traps, baited with cured salmon roe and placed at various locations near the riverbanks. Technicians identified and measured individual fish. Juvenile Chinook salmon ≥50 mm fork length (FL) were retained for marking and tag application. All healthy captives were anesthetized to allow handling and reduce associated stress. Fish were marked with the excision of their adipose fin. Binary coded wire tags were then inserted into the snout of each individual with Northwest Marine Technology (NMT) tag injectors. Tagging was performed in one session each day. The presence of the tag was then verified in each individual. Upon completion of daily tag insertion and verification, the tagged individuals were then released downstream of the workstation. Tests for short-term tag loss and mortality were performed with the retention of 200 individuals each day. Data were recorded daily on project log sheets. Estimates of valid tag releases were calculated by multiplying the total number tagged by the overnight tag retention and survival rates.

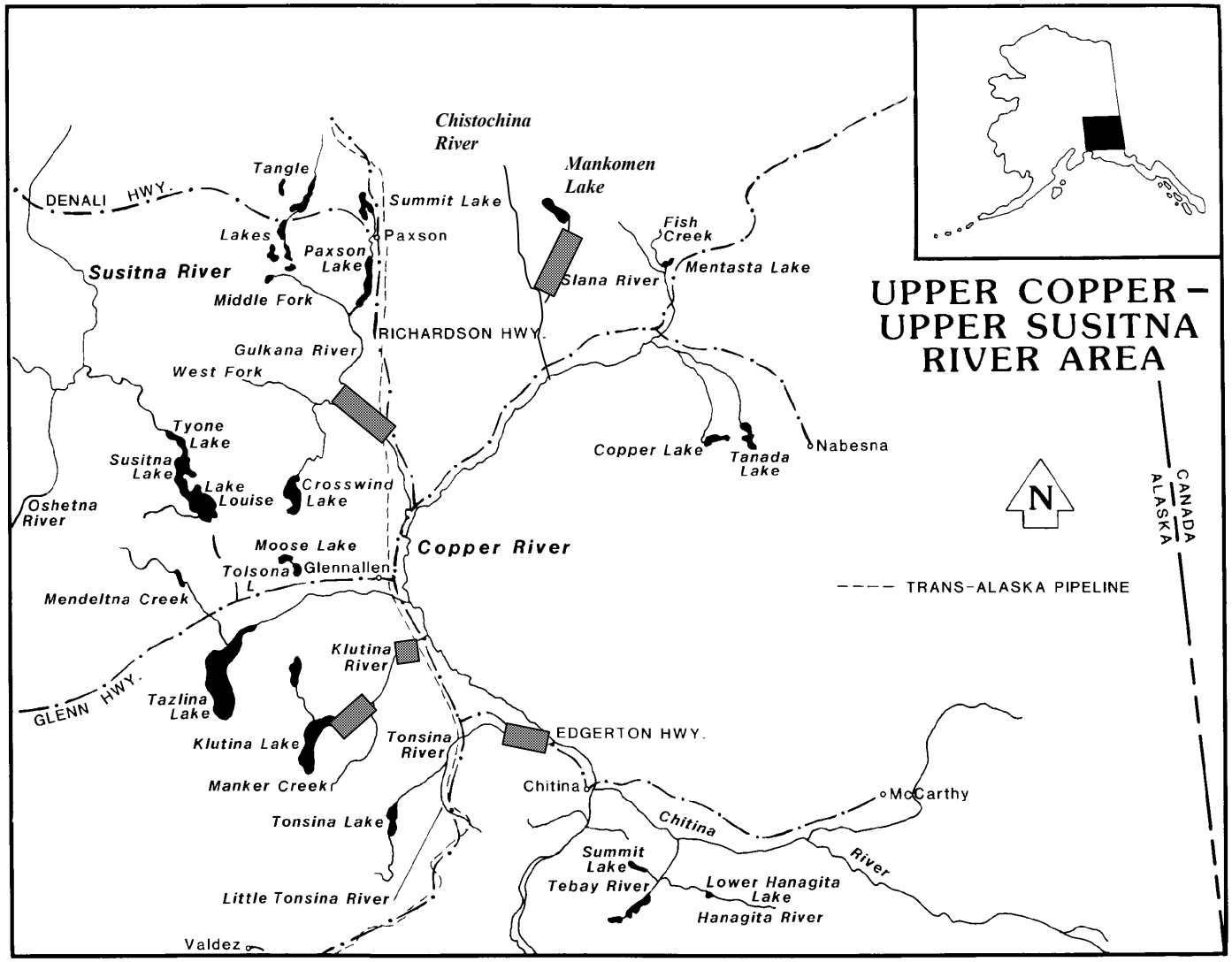

Figure 1.-Upper Copper River Basin Chinook salmon coded wire tagging locations (shaded rectangles), 1997-1999.

TAG RECOVERY

Projections

Table 2 outlines the percentages of the Copper River CWT Chinook salmon stocks that were projected to return in 2000 – 2004. The majority of the tagged fish were expected to return in 2002 (32.9%) and 2003 (31.0%).

Table 2.-Estimated years of return[a] of tag releases, shown in percentages of the total releases for each stock tagged, for the Upper Copper River Basin wild Chinook salmon coded wire tagging project.

	Stock Tagged				
Return Year	E. F. Chistochina	Gulkana	Klutina	Tonsina	All Stocks
2000	0.0%	2.3%	3.3%	3.5%	2.3%
2001	3.5%	20.1%	26.7%	30.1%	20.1%
2002	30.1%	32.9%	22.6%	46.0%	32.9%
2003	46.0%	31.0%	27.2%	19.7%	31.0%
2004	19.7%	13.2%	19.4%	0.4%	13.2%
2005	0.4%	0.3%	0.4%	0.0%	0.3%
	100.0%	100.0%	100.0%	100.0%	100.0%

[a] Calculations based on five year average of age composition estimates of Chinook salmon harvested in the Copper River District commercial fishery, 1994-1998:

Chinook Salmon Age-Class								
0.2	1.1	1.2	1.3	2.2	1.4	2.3	1.5	2.4
0.1%	0.2%	6.7%	52.1%	0.2%	39.2%	0.6%	0.3%	0.4%

Data from Donaldson et al. (1995) and Morstad et al. (1996-1999).

Tag deployment efforts resulted in a release of a total of 214,383 CWT tagged Chinook salmon with an annual average of 71,455 valid tagged individuals from all stocks combined. Based on estimated age-class composition data, with 100% survival 42,388 tagged fish were projected to return in 2001 and 70,526 fish in 2002. Assuming a survival rate of 2.5% from juvenile to adult, 1,060 tagged adults were projected to return in 2001 and 1,763 fish in 2002 (Table 3). Without having any *a priori* information on abundance of returning Chinook salmon, an annual exploitation rate of 50% with weekly rates of 65, 65, 55, 50, 15, and 15% was used based on historical numbers of weekly landings of Chinook salmon (Morstad et al. 1996). After applying these exploitation rates and this study's catch screening objectives, a recovery of 116 heads from adipose-clipped fish was projected from the 2001 commercial catch screening and 192 heads in 2002 (Table 3).

Table 3.-Projections of Chinook salmon CWT tag recoveries by week, from screening operations in 2001 and 2002.

Week	Run Timing	Tags in Copper River District	Commercial Exploitation Rate	Tags in Commercial Catch	Catch Screening Fraction	Tags Recovered from Commercial Catch	Tags Escape	Inriver Screening Fraction	Tags Recovered Inriver
				2001					
1	0.20	212	0.65	138	0.20	28	74	0.05	4
2	0.20	212	0.65	138	0.20	28	74	0.05	4
3	0.20	212	0.55	117	0.20	23	95	0.05	5
4	0.20	212	0.50	106	0.20	21	106	0.05	5
5	0.10	106	0.15	16	0.50	8	90	0.05	5
6	0.10	106	0.15	16	0.50	8	90	0.05	5
Total		1,060		530		116	530		26
				2002					
1	0.20	353	0.65	229	0.20	46	123	0.05	6
2	0.20	353	0.65	229	0.20	46	123	0.05	6
3	0.20	353	0.55	194	0.20	39	159	0.05	8
4	0.20	353	0.50	176	0.20	35	176	0.05	9
5	0.10	176	0.15	26	0.50	13	150	0.05	7
6	0.10	176	0.15	26	0.50	13	150	0.05	7
Total		1,763		882		192	882		44

Escapement of tagged fish into the Copper River past the commercial fisheries in 2001 was projected to be 530 for all stocks tagged and 882 in 2002 (Table 3). The projections were based on assumptions for survival (2.5%), exploitation (50% overall), and five-year average age-class composition estimates for annual releases of tagged juveniles. Structured in-river sampling projects were not anticipated to recover more than 5% of these tagged fish. Inriver recoveries were not expected to contribute to testing the hypothesis of equal exploitation rates for experimental stocks.

Methods

For the recovery of tags, staff of the ADF&G Commercial Fisheries Division inspected adult Chinook salmon harvested in the commercial fishery for marks (missing adipose fins) beginning in May 2001. Screening occurred at the salmon processing plants located in both Cordova and Valdez. Technicians screened the Chinook salmon harvest upon delivery to the processors. Typically the fishery is six weeks in duration each year. Sampling fraction objectives were minimums of 20% during the first four weeks and 50% during the last two weeks of the fishery. The sampling fraction was higher during the latter part of the fishery due to the reduced level of harvest.

In addition to the sampling of the commercial harvest, samples of adult Chinook salmon catches from the inriver fisheries and from scientific sampling efforts were examined for missing adipose fins when feasible. A portion of the inriver run was screened at research fish wheels located in the lower Copper River at Baird Canyon during 2001 and 2002 and in the upper river below Chitina near Canyon Creek during 2002. The harvest of the Chitina subsistence fishery was also sampled. Each individual Chinook salmon missing the adipose fin had its head removed, cleaned of gills, labeled with a numbered cinch tag, and frozen for shipment to the ADF&G CWT Lab in Juneau (CWT Lab) for tag removal and code identification.

The commercial, subsistence, and test fisheries catch sampling and data collection procedures were conducted under the guidelines detailed in the CWT sampling instructions prepared and provided to sampling personnel annually by the CWT Lab. Under these guidelines, the following information was recorded daily in a sampling log book and subsequently transcribed to the CWT Sampling Form:

1) date and type of harvest (commercial, test or subsistence fishery);
2) catcher data (gear used);
3) area where harvest occurred (commercial fishing district);
4) sampling notes, including the total number of fish screened and the number of adipose clips observed; and,
5) head recovery notes, including cinch tag number, salmon species, fork length, and sex.

Although supplemental to the study design, age, sex, and length (ASL) data were collected when practical, from each marked and sampled Chinook salmon. ASL sampling was conducted as detailed in the sampling procedures of concurrent projects, which were provided to sampling personnel. Specifically, three scales from each sampled Chinook salmon were removed and mounted on a scale gum card. In the sampling log book, a reference was maintained to gum card number, scale number, and CWT cinch tag number to maintain the association of each scale to the corresponding recovered head.

The Tag Release Summary Forms were sent to the CWT Lab where tag codes were verified and archived in the CWT Lab online database (http://tagotoweb.adfg.state.ak.us/CWT/ reports/).

RESULTS

TAG DEPLOYMENT

Tables 4 and 5 summarize the results of tagging efforts from 1997-1999. Detailed results of tag deployment are reported in Sarafin (2000).

TAG RECOVERY

A total of 171 adipose-clipped Chinook salmon were observed in 2001 and 160 were observed in 2002. Of the adipose-clipped Chinook salmon observed, 164 heads in 2001 and 159 in 2002 were recovered and dissected by the ADF&G CWT Lab for tag code identification. Fewer Chinook salmon heads were handled by the CWT Lab than were observed at the processing plants, this was due to some heads being misplaced or lost in transit.

In 2001 approximately 14,200 Chinook salmon from the Copper River commercial harvest were screened for adipose clips (Table 6). From the screened fish, 164 heads were recovered and dissected. The CWT decoding process identified 8 individuals from Copper River stocks, 33 from Alaska hatchery releases, 14 from Oregon hatchery releases, 13 from Washington hatchery releases, 3 from British Columbia hatchery releases, and 93 individuals with no tag (Table 7). Approximately 1,210 Chinook salmon were inspected for adipose clips inriver (Table 6). The inriver sampling recovered 11 heads from adipose-clipped Chinook salmon, 4 of these were from the Copper River stocks, 4 were from Alaskan hatcheries, 1 was from an Oregon hatchery and 2 heads contained no tag (Table 8).

The majority of the Copper River Chinook salmon that were recovered in the 2001 commercial fishery were Klutina River stocks, followed by the Tonsina and Gulkana rivers (Table 9). The majority of the inriver adipose-clipped Copper River Chinook salmon that were recovered were from the Klutina and Tonsina River stocks (Table 10).

In 2002 approximately 11,800 Chinook salmon from the Copper River commercial harvest were screened for adipose clips (Table 6). From the screened fish, 159 heads were recovered and dissected. The CWT decoding process identified 21 individuals from Copper River stocks, 25 from Alaska hatchery releases, 14 from Oregon hatchery releases, 7 from Washington hatchery releases, 4 from British Columbia hatchery releases, 1 from a wild Washington stock and 87 individuals with no tag (Table 7). Approximately 1,760 Chinook salmon were inspected for adipose clips inriver (Table 6). The inriver sampling recovered 12 heads from adipose-clipped Chinook salmon, 6 of these were from the Copper River stocks, 3 were from Alaskan hatcheries and 3 heads contained no tag (Table 8).

The majority of the Copper River Chinook salmon that were recovered in the 2002 commercial fishery were East Fork Chistochina River stocks, followed by the Gulkana and Klutina rivers (Table 9). The majority of the inriver adipose-clipped Copper River Chinook salmon that were recovered were from the Gulkana River stocks, followed by the Klutina and Tonsina River stocks (Table 10).

Table 4.-Upper Copper River Basin wild Chinook salmon coded wire tag release summary, 1997-1999.

Release Dates				Estimates from Overnight Retention			Valid
			Number	Number	Expanded	Tag Retention	Tag
Began	Ended	Code	Injected	Retained	Mortality	(%)	Release
			East Fork Chistochina River				
1998							
July-5	Aug-16	312660	8,002	885	74	99.9	7,920
July-16	Jul-26	312661	8,081	1,508	38	99.4	7,995
Aug-2	Aug-10	312662	7,972	1,016	78	100.0	7,894
	Total						**23,809**
1999							
Jul-2	Jul-20	310122	8,401	1,998	54	99.9	8,339
July-23	Aug-1	310123	8,947	947	92	100.0	8,855
Aug-6	Aug-16	310124	6,606	568	5	100.0	6,601
	Total						**23,795**
			Gulkana River				
1997							
July-4	Aug-13	312657	8,942	2,403	196	99.7	8,720
July-17	Jul-24	312658	7,692	1,458	18	99.9	7,666
Aug-1	Aug-9	312659	7,611	1,479	93	98.6	7,413
	Total						**23,799**
1998							
Jul-23	Aug-1	312704*2	7,275	1,200	17	96.8	7,026
Aug-3	Aug-14	312705	9,801	1,800	26	95.4	9,325
Aug-18	Aug-29	310125	7,457	1,800	0	99.0	7,382
	Total						**23,733**
1999							
Jul-1	Sept-3	310116	10,014	2,655	6	99.9	9,998
Aug-3	Aug-31	310117	10,836	3,000	11	99.9	10,814
Aug-19	Aug-24	310118	3,124	0	0	100.0	3,124
	Total						**23,936**

-continued-

Table 4.-Page 2 of 2.

Release Dates				Estimates from Overnight Retention			Valid
			Number	Number	Expanded	Tag Retention	Tag
Began	Ended	Code	Injected	Retained	Mortality	(%)	Release
				Klutina River			
1997							
July-2	Aug-26	1301031002	6,671	1,660	104	100.0	6,567
July-15	Jul-26	1301031003	8,680	1,552	154	100.0	8,526
July 29	Aug-8	1301031004	9,010	1,510	172	100.0	8,838
	Total						**23,931**
1999							
Jul-1	July-14	310119	6,257	1,593	129	99.9	6,122
July-14	July-29	310120	6,898	1,230	107	99.6	6,764
Aug-3	Aug-17	310121	10,170	1,626	68	99.6	10,062
Aug-17	Aug-18	310126	1,245	206	18	99.5	1,221
	Total						**24,169**
				Tonsina River			
1997							
July-11	Aug-21	312663	6,933	2,943	39	96.2	6,839
July-28	Aug-8	312701	5,186	2,174	20	96.2	4,970
Aug-11	Aug-21	312702	12,135	2,047	53	97.9	11,828
	Total						**23,637**
1998							
Jul-9	July-17	1301031005	5,146	1,318	105	99.2	5,001
July-21	July-31	1301031006	10,834	1,425	43	99.6	10,748
Aug-5	Aug-13	1301031007	7,927	1,000	47	99.3	7,825
	Total						**23,574**

Table 5.-Estimates of total valid tag releases for the Upper Copper River Basin wild Chinook salmon coded wire tagging project, 1997-1999.

Stock	1997	1998	1999	All Years
E. F. Chistochina	--	23,809	23,795	47,604
Gulkana	23,799	23,733	23,936	71,468
Klutina	23,931	--	24,169	48,100
Tonsina	23,637	23,574	--	47,211
All Stocks	71,367	71,116	71,900	214,383

Table 6.-Number of Chinook salmon caught, number screened for clipped adipose fins, and number of adipose-clipped fish observed by statistical week in the Copper River District drift gillnet commercial fishery and inriver recoveries, 2001 and 2002.

Statistical Week	Catch Dates	Catch	Number Screened for Clips	Number of Clips Observed	% Screened for Clips	Number Screened to Clip Ratio	Cumulative Clips Observed
			2001 Commercial Sampling				
20	5/17/01	5,678	1,991	2	35.1%	995.5	2
21	5/21-5/25	14,651	5,143	5	35.1%	1,028.6	7
22	5/28-6/2	6,060	2,255	10	37.2%	225.5	17
23	6/4-6/8	7,309	3,137	32	42.9%	98.0	49
24	6/11-6/15	2,933	896	20	30.5%	44.8	69
25	6/18-6/22	1,764	435	25	24.7%	17.4	94
26	6/25-6/29	1,118	193	42	17.3%	4.6	136
27	7/2-7/6	573	109	18	19.0%	6.1	154
28	7/9-7/13	243	35	10	14.4%	3.5	164
29	7/16-7/20	86	15	5	17.4%	3.0	169
30	7/23-7/24	18	5	2	27.8%	2.5	171
	Totals	40,433	14,214	171	35.2%	83.1	
			2001 Inriver Sampling				
-	-	-	1,208	11	-	109.8	11
			2002 Commercial Sampling				
20	5/16	4,841	1,063	6	22.0%	177.2	6
21	5/20-5/23	15,879	4,965	16	31.3%	310.3	22
22	5/27	4,538	1,360	11	30.0%	123.6	33
23	6/3-6/7	7,591	2,118	20	27.9%	105.9	53
24	6/10-6/14	5,488	1,814	58	33.1%	31.3	111
25	6/17	1,282	395	42	30.8%	9.4	153
26			**No Commercial Openings This Week**				
27	7/6-7/7	73	26	0	35.6%	(0:26)	153
28	7/9-7/13	152	19	5	12.5%	3.8	158
29	7/15-7/20	89	9	2	10.1%	4.5	160
	Totals	39,933	11,769	160	29.5%	73.6	
			2002 Inriver Sampling				
-	-	-	1,759	12	-	146.6	12

Table 7.-Origin of tag codes identified from Chinook salmon recovered from the Copper River drift gillnet commercial fishery, 2001 and 2002.

Origin of Stock	Number Found	Percentage of Total
2001		
(No Tag)	93	57%
Alaska, Hatchery	33	20%
Oregon, Hatchery	14	9%
Washington, Hatchery	13	8%
Copper River, Wild	**8**	**5%**
British Columbia, Hatchery	3	2%
Total	164	100%
2002		
(No Tag)	87	55%
Alaska, Hatchery	25	16%
Copper River, Wild	**21**	**13%**
Oregon, Hatchery	14	9%
Washington, Hatchery	7	4%
British Columbia, Hatchery	4	3%
Washington, Wild (Lewis River)	1	1%
Total	159	100%

Table 8.-Origin of tag codes identified from Chinook salmon recovered from the Copper River inriver recovery efforts, 2001 and 2002.

Origin of Stock	Number Found	Percentage of Total
2001		
Copper River, Wild	**4**	**36%**
Alaska, Hatchery	4	36%
(No Tag)	2	18%
Oregon, Hatchery	1	9%
Total	11	100%
2002		
Copper River, Wild	**6**	**50%**
(No Tag)	3	25%
Alaska, Hatchery	3	25%
Total	12	100%

Table 9.-Copper River Chinook salmon coded-wire tag recoveries by stock and week from the Copper River District drift gillnet commercial fishery, including estimates of contribution in the catch for each stock, 2001 and 2002.

Statistical Week	Catch Date	Stock of Recovered Tag	Number of Recoveries by Stock	Estimate in Catch (N)
		2001		
23	6/4-5/01	Tonsina	2	5.45
23	6/5/01	Gulkana	1	2.67
23	6/8/01	Klutina	1	2.66
24	6/15/01	Klutina	2	7.27
25	6/19/01	Klutina	2	8.11
		2002		
20	5/16/02	East Fork Chistochina	2	8.03
20	5/16/02	Klutina	1	4.01
21	5/20-23/02	East Fork Chistochina	5	15.68
21	5/20-23/02	Gulkana	5	15.71
22	5/27/02	East Fork Chistochina	3	8.19
22	5/27/02	Gulkana	2	5.60
23	6/3/02	Gulkana	1	3.73
23	6/4/02	East Fork Chistochina	1	3.70
24	6/10/02	East Fork Chistochina	1	3.23

Table 10.-Origin of tag codes identified from Chinook salmon recovered from in-river sampling, 2001 and 2002.

Date Sampled	Type of Sample	Location of Sample	Stock
		2001	
6/15/01	Inriver Test Fishery	Baird Canyon	Klutina
6/22/01	Inriver Test Fishery	Baird Canyon	Tonsina
6/30/01	Inriver Test Fishery	Baird Canyon	Alaska Hatchery
7/1/01	Inriver Test Fishery	Baird Canyon	Oregon Hatchery
7/1/01	Subsistence Harvest	Chitina Subdistrict	Klutina
7/1/01	Subsistence Harvest	Chitina Subdistrict	Tonsina
7/11/01	Inriver Test Fishery	Baird Canyon	Alaska Hatchery
7/14/01	Subsistence Harvest	Chitina Subdistrict	Alaska Hatchery
7/20/01	Subsistence Harvest	Chitina Subdistrict	No Tag
7/28/01	Subsistence Harvest	Chitina Subdistrict	Alaska Hatchery
8/4/01	Subsistence Harvest	Chitina Subdistrict	No Tag
		2002	
6/2/02	Inriver Test Fishery	Baird Canyon	Gulkana
6/3/02	Inriver Test Fishery	Baird Canyon	Gulkana
6/7/02	Inriver Test Fishery	Baird Canyon	Head Lost
6/9/02	Inriver Test Fishery	Baird Canyon	Gulkana
6/15/02	Subsistence Harvest	Chitina Subdistrict	Head Lost
6/15/02	Subsistence Harvest	Chitina Subdistrict	Klutina
6/22/02	Inriver Test Fishery	Baird Canyon	No Tag
6/28/02	Inriver Test Fishery	Baird Canyon	Tonsina
6/29/02	Inriver Test Fishery	Baird Canyon	No Tag
6/30/02	Subsistence Harvest	Chitina Subdistrict	Alaska Hatchery
7/2/02	Inriver Test Fishery	Baird Canyon	No Tag
7/3/02	Inriver Test Fishery	Baird Canyon	Head Lost
7/3/02	Inriver Test Fishery	Baird Canyon	Alaska Hatchery
7/5/02	Subsistence Harvest	Chitina Subdistrict	Klutina
8/4/02	Subsistence Harvest	Chitina Subdistrict	Alaska Hatchery

As an aside, in 2000 a Copper River tagged Chinook salmon was caught off of the Western coast of Baranof Island during the Southeast Alaska troll fishery. The fish was recovered in Sitka on August 30. The fish had been tagged on the Klutina River during the period of July 15 – 26, 1997.

DISCUSSION

Although the sampling efforts recovered an insufficient number of Copper River stock tags for the planned analysis, other information supplemental to the original project objective was gained from tag recoveries of non-Copper River origin. When the commercial catch sampling data were combined from 2001 and 2002 it was shown that Alaskan hatcheries contributed 18% to the total CWT samples, Washington and Oregon hatcheries contributed 15% and British Columbia hatcheries 2%. The 2001 and 2002 inriver recovery efforts showed a similar pattern, with 30% of the CWT samples attributed to Alaskan hatchery fish and 4% from an Oregon hatchery. These results document the occurrence of hatchery straying as far upstream as Chitina in the Copper River. A query of the CWT Lab database shows similar Chinook salmon straying patterns on the Stikine River in Southeast Alaska. Taku River wild and Baranof Island hatchery Chinook salmon stocks are occasionally recovered during Stikine River drainage escapement surveys; both these stock groups originate over 300 miles from the Stikine River.

The majority (56%) of the Chinook salmon heads recovered from the Copper River commercial fishery and sent to the CWT Lab in 2001 and 2002 contained no tags. This is a common occurrence and may be due to migration of the tag throughout the body of the salmon, incorrect tag placement, tag loss, and/or fish from Washington and Oregon hatcheries that have had their adipose fins clipped as a mark even though they do not have a CWT implant. Approximately 22% of the inriver sampled Chinook salmon heads that were sent to the CWT Lab contained no tag. This lower rate observed in-river lends support to the hypothesis that a large proportion of the adipose-clipped but untagged Chinook salmon in the commercial fishery were fish of non-Copper River origin.

The inriver sampling produced fewer samples than projected. This may have been due to fewer adipose-clipped fish returning than had been predicted. Factors that may have affected the number of fish returning include decreased survival rates; increased marine exploitation rates and/or adipose-clipped Chinook salmon may have been less susceptible to inriver sampling methods (fish wheels, dip nets) compared to non-tagged fish. The latter scenario is unlikely because studies on CWT salmon have shown little behavioral change between tagged and untagged fish (Northwest Marine Technology 2004). Too few fish were recovered inriver to test any assumptions about mortality and/ or exploitation rates.

Even though the combined 2001 and 2002 seasons were predicted to contain 53% of the returning tags (Table 2), catch screening of the commercial fishery during those years failed to recover a sufficient number of tags to meet project objectives. Due to the low rate of tag recovery that occurred, it was determined that future catch screening was not likely to recover a sufficient number of tags to meet the designed objectives. Therefore, no further recovery efforts were planned for 2003 and 2004.

ACKNOWLEDGEMENTS

The authors would like to thank Melanie Guerrero and Al Cox, the Commercial Fisheries technicians who sampled commercial Chinook salmon catches in Cordova and Valdez. The Juneau ADF&G Tag Lab staff performed an invaluable service by dissecting the Chinook salmon heads; recovering and decoding the coded wire tags; and making the data available in their on-line database. The assistance the Native Village of Eyak (NVE) performed by letting us use their fish wheels was appreciated. Inriver sampling was performed by ADF&G technicians Ron Burr "Bee", Thrina Marsing, Mark Stadtmiller, Jim Maple, and Doug Vollman at the NVE fish wheels and the Chitina subsistence fishery. Thanks to Dave Bernard and Dan Reed for biometric assistance, Matt Evenson and Tom Taube for editorial comments, and Sara Case for finalizing the report for publication.

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